very plausible, they learn that we can not accept them, or that they are contrary to experience, or inconsistent with well established principles, or can only be of local and temporary importance. For example, if one man addresses the President of the United States claiming that the evaporation from plowed land in Kansas and Nebraska produced evaporation and haze until eventually rain fell and that nothing will produce rain except evaporation, he must not be surprised to have his communication referred to the Weather Bureau and to learn that the evaporation from Nebraska could only have produced a very small part of the rain, if indeed it had anything at all to do with the rain that fell over Kansas and Nebraska. If the same correspondent enthusiastically addresses the Secretary of the Interior as to the need of conserving the waters of the Platte River and increasing the reservoirs of water so as to stimulate evaporation, he must be told by the Director of the Geological Survey that rains which are to produce any appreciable good effect generally result from conditions of such great extent that the water contributed by evaporation in Kansas and Nebraska would not be appreciable. Evidently such a persistent advocate of his own ideas is scarcely willing to accept as a finality the opinions of recognized experts. Why then should he not reason out the matter to suit himself; why ask a specialist to investigate the value of a crude idea whose value he could easily have settled to his own satisfaction by his own personal study? It would take him but a few minutes to figure out the quantity of rain that fell and the preceding quantity of moisture evaporated from the soil and, according to his theory, necessary to furnish that rain, e. g., if 8 inches of rain fell on a soil that had received no rain for three months and from which scarcely an inch in depth of water could have evaporated, then this 1 inch could not have produced those 8 inches.

Almost the same course of reasoning applies to a correspondent from Alabama, who maintains that carbonic-acid gas is increasing in the atmosphere and causing the climate to change toward the tropical conditions of earlier ages. Of course he has no observations to show that there was an extra amount of carbonic-acid gas in the atmosphere in past geological ages, and certainly there is nothing to show an appreciable increase in carbonic-acid gas in the free atmosphere during the past century. The so-called theory on which he bases his "Warning Number 2" is based upon his own idea as to the use of coal, petroleum, etc. He entirely ignores what we already know about counteracting influences that counterbalance the increasing danger that he anticipates, and that require the officials in Washington to dismiss his "theory" of the weather as wholly illusory.

The term *theory* is employed quite improperly in such cases. These correspondents are offering suggestions, well meant indeed, but not of sufficient importance to be called well considered theories. A *theory* with regard to any natural phenomenon is a plan or scheme based on principles that are verifiable by experiment, observation, and analysis; a rational explanation that agrees with all the facts and disagrees with none. It is only a very loose and popular error to speak of a *theory* when we mean merely a *hypothesis* or *speculation*. A proposed explanation, or a working hypothesis, is framed in order to account for any fact that is not well understood, and it is only after this hypothesis has been well established or, if necessary, replaced by successive approximations, that one is eventually justified in building up a rational theory. Speculations, hypotheses, and suggestions should not be called theories until one or more of them have been successfully demonstrated by experiment and by observation.

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Another class of correspondents and newspaper writers are as apt to ignore the history of the progress of science as the above-mentioned writers ignore the philosophy of science. Thus, from one author we understand that the idea of the general adoption of rational meteorological units in this country is the result of the initiative taken by Prof. McAdie in 1908, whereas, his proposition of that year was but one of many that had been under discussion in all the weather bureaus of the world for many years previous, and, in fact, ever since the conception of the metric system of units. We are very glad that at Blue Hill Observatory Prof. McAdie will introduce the system advocated by Bjerknes and his followers.—[C. A.]

CONTINUOUS PICTURES OF THE WEATHER.

Among the many suggestions received by the Weather Bureau from well-meaning correspondents interested in the progress of the study of the atmosphere considered as a branch of physics and dynamics rather than as a branch of climatology, one correspondent desires a picture of weather changes and their relations to each other to be presented as a series of small daily maps, nine to a page, and continuous for a month and showing isobars, isotherms, rise or fall of temperature, the direction and force of the wind, cloudiness, rainfall, thunderstorms and tornadoes, and perhaps some other items, especially the absolute moisture, which latter can perhaps be given approximately for the total column of atmosphere over any station. Of course such a series of maps would have some value, but something similar has been published for many years by various European weather services, and now in place of this series of small maps the U. S. Weather Bureau has taken a far more important step by publishing that daily map of atmospheric temperature and pressure over the whole Northern Hemisphere that has for some years past proved so very useful in its long-range weather forecasts.

We are convinced that it is only by the study of atmospheric conditions over the whole Northern Hemisphere, as if photographed daily, that we shall ever be able to appreciate the preponderating influence of the diurnal rotation of the earth and the general circulation of the atmosphere as compared with the minor influence of sunshine, radiation, and moisture. That is to say, these last three influences that start the atmosphere in motion are completely overshadowed by the effect of that motion combined with the swift rotation of the earth. The relative importance of these influences on the atmosphere as a whole is quite analogous to their relative importance in the case of a hurricane, where sunshine, moisture, heat, radiation, all come into play and would of themselves start the atmosphere into direct lines of motion toward a center of low pressure; whereas the rotation of the earth turns that radial movement into an almost perfect circle. The relative importance is analogous to the influence of gravity on a bowlful of water escaping at the outlet, where the least deviation from symmetry converts the straight line into a circular motion.

Atmospherics is not merely a study of the physics of the atmosphere on the scale of a laboratory experiment; it is a problem in terrestrial physics in which the overpowering influence of the earth considered as a small planet must be fully considered. The lower layers of the atmosphere being resisted by continents and highlands move almost independent of the upper layers that have scarcely any connection with the lower layers, by way

of viscosity or fluid friction, and still less connection due to terrestrial resistances. These upper layers are affected by radiation and absorption, by density, by the attraction of the earth, the moon, and the sun, by the action of solar electrons and cosmic shooting stars, and by the motion of the earth in space, as well as its diurnal rotation. Their motions represent the sum total of astronomical and planetary influences, and they react in a most complicated manner upon the lowest layer of the atmosphere which is under the influence of convective circulation.

The study of the motions of the centers of high and low pressure presented to us every day on these international polar charts of the Northern Hemisphere, may be conducted either by pure analysis, or by graphic methods, or by laboratory experiment. Some suggestions with regard to the latter will be found in the MONTHLY WEATHER REVIEW, December, 1907, volume 35, page 559.

With regard to graphic methods of approaching the problem, I believe that two memoirs, one of which is to appear in the Bulletin Mount Weather Observatory, volume 6, part 5, and the other to appear in this REVIEW, present almost our first practical ideas; their further development and application to our daily weather maps will, we hope, stimulate our best mathematicians to renewed efforts.

With regard to the purely analytical treatment of the problems of atmospherics, the best men, such as Helmholtz, Lord Kelvin, Margules, Lord Rayleigh, Prof. Lamb, and many others, have contributed here and there a mite toward the completion of the work done by Ferrel, but hitherto each has found it impracticable to even attack in its generality that problem which must be solved by some future generation before all doubts and difficulties have been removed.—[C. A.]

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PROPOSED DAILY WEATHER MAP FOR THE SOUTHERN HEMISPHERE.

All meteorologists will be interested in a letter from W. Martin Watt, Agricultural Engineer, Salisbury, Rhodesia, who says:

I am very much obliged for your memorandum covering a copy of the weather map of the United States and the Northern Hemisphere. I find in it a most interesting study, and if it is not asking too much I should be very grateful for an occasional copy.

I trust it will not be long before a similar map is prepared for the Southern Hemisphere, as it would be of immense assistance to forecasters.

This idea of a comprehensive weather map of the world—namely, a map of both Southern and Northern Hemispheres—has been in the minds of most meteorologists for many years. A plan for maps appropriate to their study was published in full in the MONTHLY WEATHER REVIEW for December, 1907, volume 35, page 559. Perhaps the first question to be decided before such maps are prepared will be whether the map of the Southern Hemisphere on a polar projection, should be drawn as seen from the South Pole, or as seen from the North Pole.

The ordinary geographer gives us a map of the Northern Hemisphere as seen from the North Pole and one of the Southern Hemisphere as seen from the South Pole; but all studies in which dynamics enters so intimately as it does in our meteorology require that the point of view should be uniform for both hemispheres, just as it also requires that the observations should be simultaneous with regard to time, and just as the astronomical problems require that same conformability.

The hope that Mr. Watt expresses is perfectly attainable now that the world has at hand the resources offered by wireless telegraphy and ocean cables.

What was supposed to be a mere dream 60 years ago has become an actual reality; no one can foresee what may become a commonplace matter 50 years hence.

The map of the Northern Hemisphere is a matter of coöperation between the northern nations; but these are the powers that have ruled the beginnings of civilization in both Northern and Southern Hemispheres.

A few words from the North and a little financial coöperation would quickly bring to actual realization the daily weather map of the Southern Hemisphere.

The so-called International Meteorological Congress and especially its Permanent Committee may properly take under advisement the project suggested by Mr. Watt.

Africa, Australia and South America, the South Atlantic, the South Pacific and the Indian oceans, certainly need and are worthy of a daily weather map of the Southern Hemisphere. It will pay them and will pay the merchants of the whole world.

The study of the southern map will, indeed, greatly assist the student of the northern map. From pole to pole, around the whole globe and upward to its limits, the atmosphere must be studied as a unit if we would so thoroughly understand its phenomena as to enjoy that accurate long-range forecasting which is to be the privilege of future civilized nations. "Nil desperandum, labor omnia vincit."—[C. A.]

NOTES.

The first structure that the Massachusetts Institute of Technology has erected for its own uses on its site in Cambridge is the new aerodynamic laboratory. The building is finished and the apparatus is in process of installation. The portion of its equipment that is first to be installed is the 4-foot wind tunnel with its accompanying blower. This is of the pattern now in use at the National Physical Laboratory at Teddington, England, which has furnished the plans.

SEISMIC DISTURBANCES IN THE PHILIPPINES.

The Philippine Journal of Science No. 4, published at Manila, August, 1913, contains a careful study of seismic disturbances in the Philippines by M. Saderra Masó and Warren D. Smith. The authors show that seismology and geology combined is a matter of great practical value to humanity and especially to great engineering projects. The major earthquakes are not due to volcanoes, but to splits, cracks, and shifts in the solid rock. They are tectonic and not volcanic. The practical conclusions which the authors draw from their investigations are as follows:

1. The fact of the instability of the earth's crust has been proved time and again both by tremendous catastrophes and by laboratory experiments. It has been demonstrated that many of these devastating earth movements take place along definite lines of weakness in the crust. The location and extent of these lines can usually be fairly accurately determined by a geological examination.

2. The points of intersection of such lines are dangerous as can be shown by an examination of the Province of Calabria in Italy.

3. Volcanoes are only incidental phenomena, and are results rather than causes. They are usually found to be lined up along some rift line. * * *

5. Types of structure best suited to Philippine conditions—

(a) Bamboo houses. All parts tied together with rattan.